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CRUISE DATA REPORT R/V ATLANTIS II 93 LEG 7

by

Robert C. Groman and Jane A. Dunworth

WOODS HOLE OCEANOGRAPHIC INSTITUTION Woods Hole, Massachusetts 02543

April 1978

TECHNICAL REPORT

Prepared for the Office of Naval Research under Contract N00014-74-C0262, NR083-004 and the Oceanographic Section, National Science Foundation, through Grant OCE-75-21522.

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Approved for Distribution

John I. Ewing, Chairman
Department of Geology and Geophysics

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Cruise Summary

The R/V ATLANTIS II Cruise 93 Leg 7 left Port Louis, Mauritius, 8 April 1976 on a 29 day geophysical and geological survey in the Mascarene and Somali Basins in the Western Indian Ocean. Table 1 lists the members of the scientific party. Seventeen piston cores were successfully recovered in the Mascarene Basin, Amirante Trench and Somali Basin regions. Table 2 summarizes these coring stations. Single channel continuous seismic profiles were made on 2920 km of ship's track in the Somali Basin. Echo soundings, total geomagnetic field and gravity field data were collected throughout the entire leg. The R/V ATLANTIS II arrived in Mombasa, Kenya, on 6 May 1976. For analysis of the data collected during this cruise see Bunce and Molnar (1977) and Johnson and Bunce (1977). We present here summary charts of the underway data collected during this cruise.

Data Acquisition and Processing

Navigation data, which consisted of satellite fixes, visual bearings and dead-reckoned positions, were acquired by the ship's officers and key-punched daily. A computer

program was used to plot these data on Mercator charts for verification by comparison with the bridge Mercator navigation plots. The incremental headings and speeds between successive fixes were determined and compared with the ship's log to access the accuracy of the plotted navigation points. A more complete navigation stream was obtained by merging the satellite navigation fixes with ship's velocity determined from a Doppler speed log and Sperry Mark 19 gyrocompass. Depths were measured primarily using a 3.5 kHz echo sounder recorded on a Hydroproducts recorder, and digitized by hand at five minute intervals or at every break-in-slope. During a few short intervals the 3.5 kHz system was down and a 12 kHz transducer was used instead. These data were then punched on paper tape and corrected for sound velocity via Matthews' Tables (1939) using a computer program. Total-field magnetic intensity was measured with a Varian proton precession magnetometer towed 250 meters behind the ship. One minute values were recorded, and the magnetic field anomaly was calculated by subtracting the International Geomagnetic Reference Field of 1975. The digital data were plotted as a function of elapsed time and corrected by comparison with the original analog records. Magnetic field data were not taken during

stations. Gravity measurements were made with a vibratingstring accelerometer on a gyro-stabilized table (Bowin
et al., 1972) whose output was recorded as five-minute
averages. Corrections were applied for Eotvos and
instrumental drift, and the free air and simple Bouguer
anomalies were calculated. The gravity and magnetic
anomalies and bathymetry were then merged with the detailed
navigation.

These data are available on magnetic tape and have been forwarded to the National Solar-Terrestrial Data Center in Boulder, Colorado.

Data Summary Plots

Figure 1 shows a summary of the ship's track. In order to display the data coverage to better advantage, we have divided the cruise into four areas. Figures 2a-d display the date at change of day and time ticks every six hours. Station locations and seismic coverage are indicated as shown. Figures 3a-d show corrected meters plotted at right angles to the ship's track. The plotting scales are 0.8 inches per degree of longitude and 2000 meters per inch. The ship's track represents a depth of 4000 meters. Figures 4a-d show the total geomagnetic field anomaly plotted

at right angles to the ship's track. The plotting scales are 0.8 inches per degree of longitude and 1000 gammas per inch. The ship's track represents 250 gammas in order to remove a positive bias. Figures 5a-d showing the gravity free air anomaly are plotted at 0.8 inches per degree of longitude and 250 milligals per inch.

Acknowledgements

Support for this cruise came from the Oceanography
Section, National Science Foundation, through Grant 21522.
We gratefully acknowledge the help of Captain David Casiles
and the entire crew and other members of the scientific
party. Thanks are due to L. Whiteley for her contribution
of figure 1 and J. Broda for the preparation of table 2.

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- Bunce, Elizabeth T. and Peter Molnar, Seismic reflection profiling and basement topography in the Somali Basin: possible fracture zones between Madagascar and Africa, JGR 82, 33, November 10, 1977.
- Johnson, David A. and Elizabeth T. Bunce, Abyssal sediment waves in the Amirante passage, Western Indian Ocean, WHOI Technical Report 77-7, February 1977, unpublished manuscript.
- Bowin, C., R.A. Folinsbee and T.C. Aldrich, VSA gravity meter system: tests and recent developments, JGR 77, pp. 2018-2033, 1972.
- Leaton, B.R., I.A.G.A. division 1, study group, in EOS <u>57</u>, pp. 120-121, 1976.

Table 1: Scientific Party

Name	Affiliation if other than W.H.O.I.
E.T. Bunce, Chief Scientist	
J. Broda	
E. Carter	M.I.T. and W.H.O.I.
R. Goldsborough	
P. Goreau	W.H.O.IM.I.T. Joint Program Student
R.C. Groman	
B.U. Haq	
D.A. Johnson	
G. Marshall	University of Alberta, Guest Student Investigator
P. Molnar	M.I.T. Staff
C. Polloni	

E. Young

7

Table 2.
AII 93 LEG 7 STATION SUMMARY

C: piston core Depth G: Pilot in gravity core Meters	970 cm 4641	1088 cm 4599 97 cm	554 cm 4196 108 cm	1180 cm 3726 96 cm	1080 cm 3888 104 cm	1034 cm 4116 113 cm	972 cm 4129 89 cm	439 cm 4154 85 cm	729 cm 4148 125 cm	846 cm 3975
PC: pi PG: Pi gravi	PC: 9	PC: 1	PC: 5	PC: 1	PC: 1	PC: 1	PC: 9	PC: 4	PC: 7	PC: 8
Longitude	53°31.5'E	54°29.9'E	52°23.8'E	52°31.5'E	52°28.61'E	51°57.7'E	52°01.5'E	52°09.9'E	52°26.3'E	52°28.6'E
Latitude	15°17.4'S	11°01.2'S	09°28.5'S	. 09°33.2'S	09°29.24'S	09°26.5'S	09°24.8'S	09°28.4'S	09°30.7'S	09°32.5'S
Physiographic Location	Northern Mascarene Basin	Northern Mascarene Basin	Southern Amirante Trench	Southern Amirante Trench	Southern Amirante Trench	Mud Waves: West Flank of Amirante Trench	Abyssal Plain, Western Margin of Amirante Trench	Abyssal Plain, Western Margin of Amirante Trench	Southern Amirante Trench	Hill on Western Flank of Amirante Trench
Date	10 April 76	11 April 76	14 April 76	14 April 76	14 April 76	15 April 76	15 April 76	15 April 76	16 April 76	16 April 76
Station No. and Type	(21) Piston Core (4 PC)	(22) Piston Core (5 PC)	(23) Piston Core (6 PC)	(24) Piston Core (7PC)	(25) Piston Core (8PC)	(26) Piston Core (9PC)	(27) Piston Core (10PC)	(28) Piston Core (11PC)	(29) Piston Core (12PC)	(30) Piston Core (13PC)
	(21	(22)	(23	(24	(25	(26	(27	(28	(29	(30

Table 2 (continued)

Depth in Meters	4471	4444	2490	5115	5109	5089	2080
Length PC: Piston Core PG: Pilot gravity core	PC: 839 cm PG: 94 cm	1123 cm 125 cm	275 cm	944 cm 138 cm	891 cm 151 cm	827 cm 102 cm	156 cm no recoring
PC: PG: gra	PC: PG:	PC:	PC:	PC:	PC:	PC:	PG:
Longitude	52°22.9'E	50°08.9'E	49°32.2'E	52°23.9'E	51°36.1'E	50°57.1'E	50°32.9'E
Latitude	09°29.9'S	07°16.5'S	07°15.4'S	02°03.8'N	00°32.5'N	01.01.8'S	02°01.8'S
Physiographic Location	Channel Along Western Margin of Amirante Trench	Southern Somali Basin	Southern Somali Basin	Central Somali Basin	Central Somali Basin	Central Somali Basin	Central Somali Basin
Date	17 April 76	18 April 76	20 April 76	1 May 76	. 1 May 76	2 May 76	2 May 76
Station No. and Type	(31) Piston Core (14PC)	(32) Piston Core (15PC)	(33) Piston Core (16PC)	(34) Piston Core (17PC)	(35) Piston Core . 1 May 76 (18PC)	(36) Piston Core (19PC)	(37) Piston Core (20PC)

Table 3

Seismic Reflection Profiling Dates and Times (time in GMT)

Mascarene Basin

			Star	ct			Er	nd		
1.	11	April	1978	-	2000	14	April	1978	-	0415
2.	14	April	1978	-	1630	15	April	1978	-	1400
3.	16	April	1978	-	1000	16	April	1978	-	1630
4.	17	April	1978	-	0500	18	April	1978	-	1115

Somali Basin

	Start	End				
Lines 1-30	22 April 1978 - 0300	30 April 1978 - 1730				
Line 31	3 May 1978 - 1045	4 May 1978 - 0230				

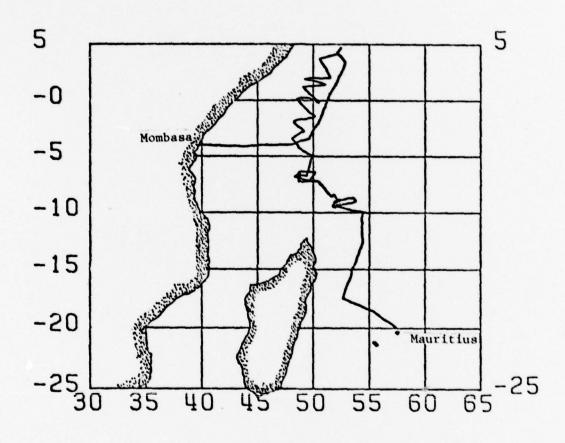


FIGURE 1:
All 93 LEG 7 NAVIGATION SUMMARY CHART

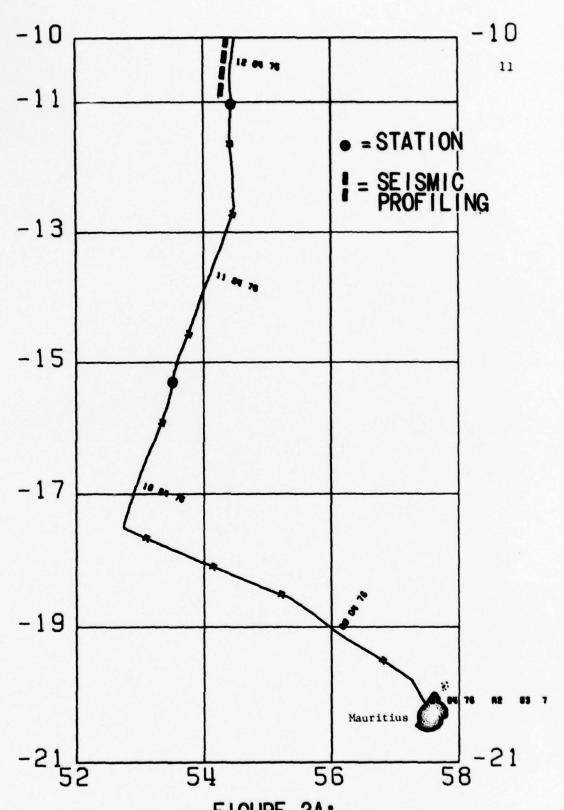
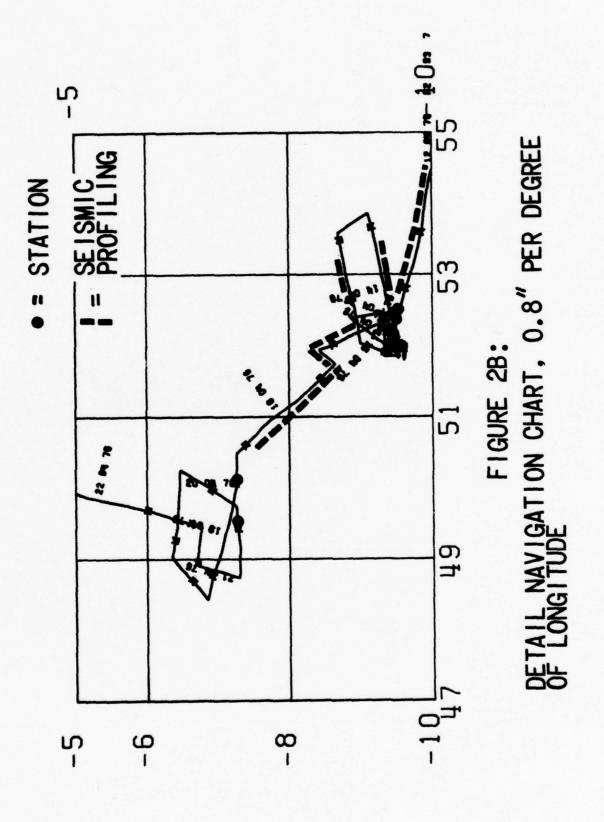
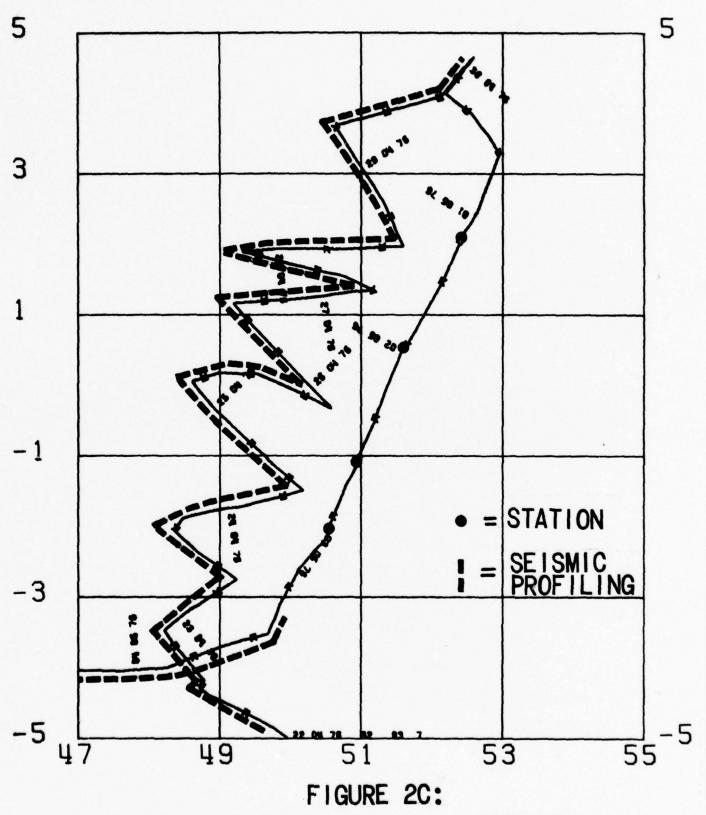
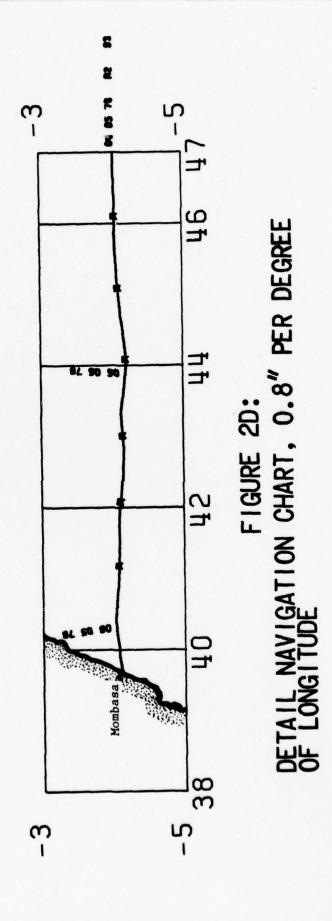


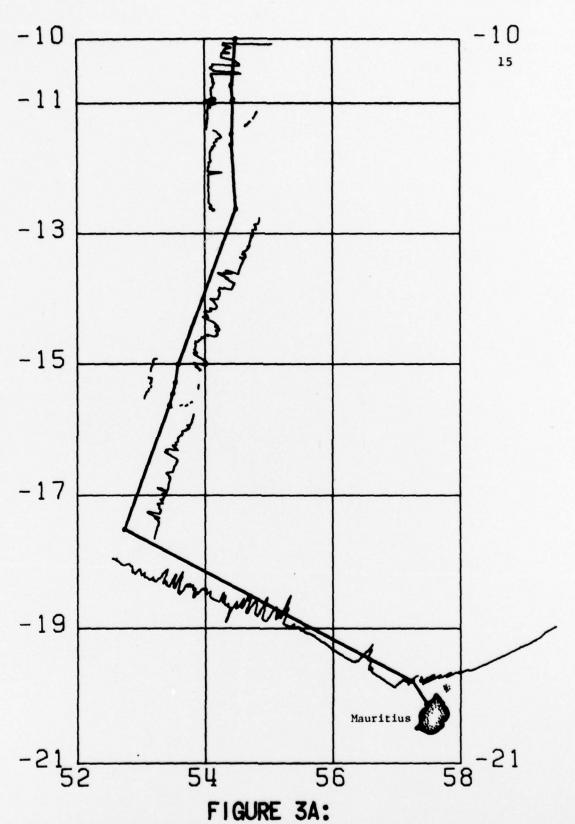
FIGURE 2A:
DETAIL NAVIGATION CHART, 0.8 PER DEGREE
OF LONGITUDE



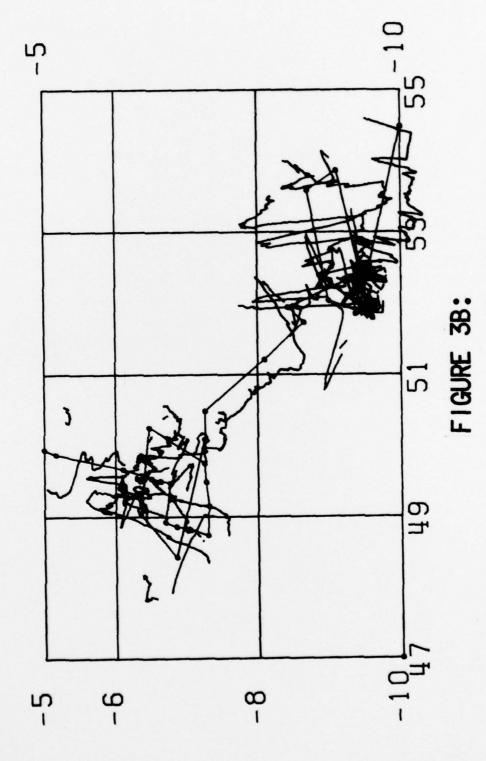


DETAIL NAVIGATION CHART, 0.8" PER DEGREE OF LONGITUDE

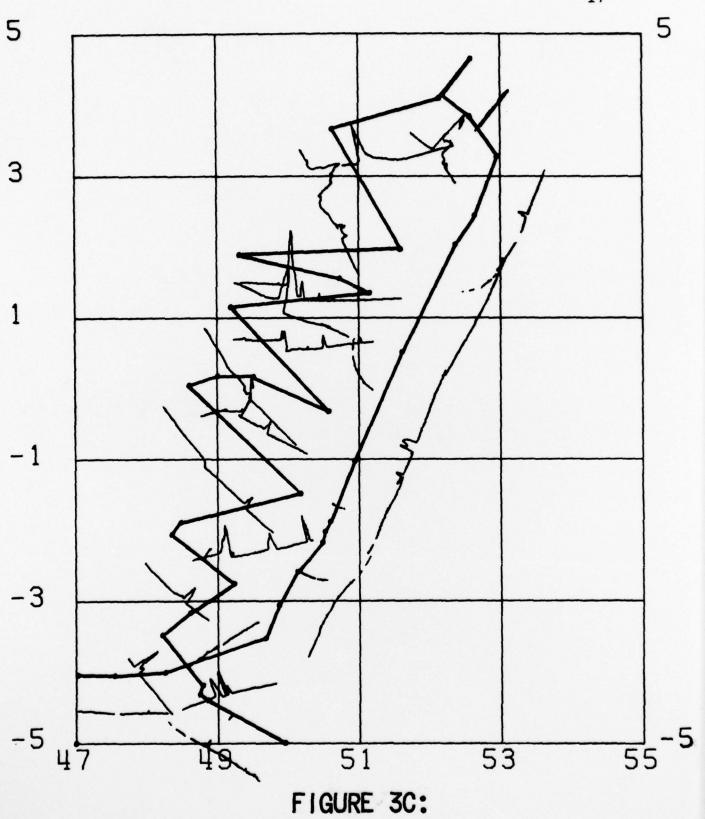




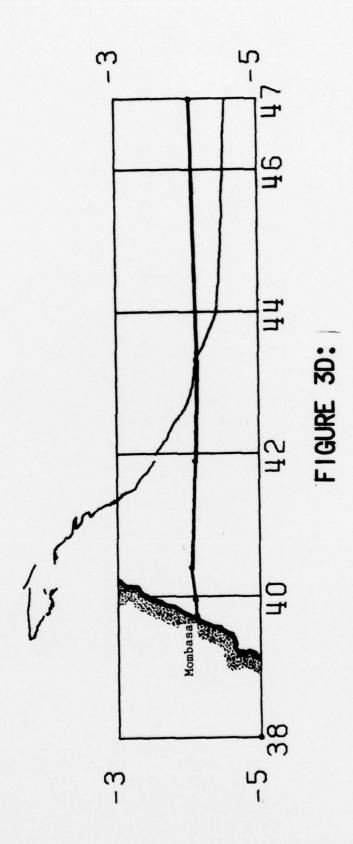
CORRECTED METERS AT 2000 METERS PER INCH. SHIP'S TRACK EQUALS 4000 METERS.



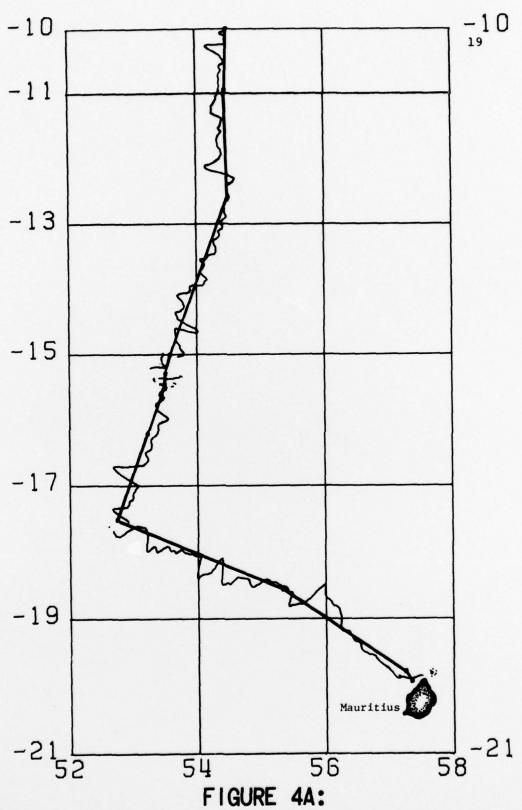
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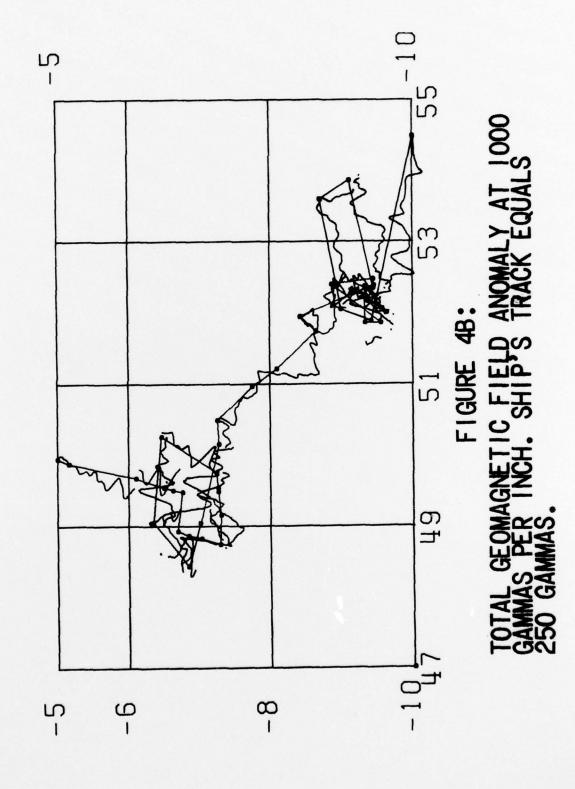
CORRECTED METERS AT 2000 METERS PER INCH. SHIP'S TRACK EQUALS 4000 METERS.



CORRECTED METERS AT 2000 METERS PER INCH. SHIP'S TRACK EQUALS 4000 METERS.



TOTAL GEOMAGNETIC FIELD ANOMALY AT 1000 GAMMAS PER INCH. SHIP'S TRACK EQUALS 250 GAMMAS.



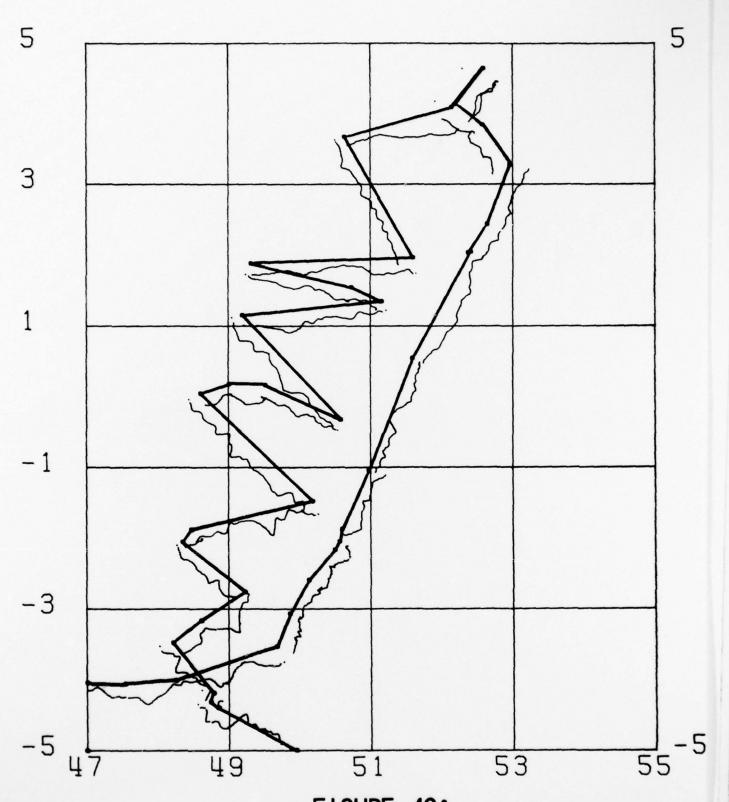


FIGURE 4C:
TOTAL GEOMAGNETIC FIELD ANOMALY AT 1000
GAMMAS PER INCH. SHIP'S TRACK EQUALS
250 GAMMAS.

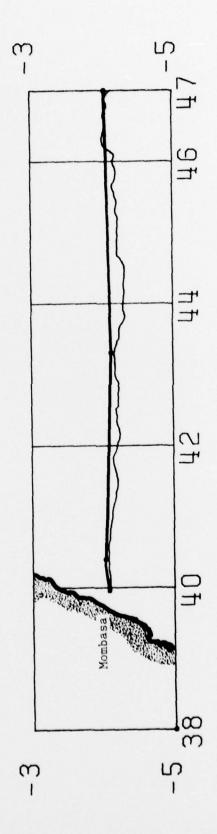
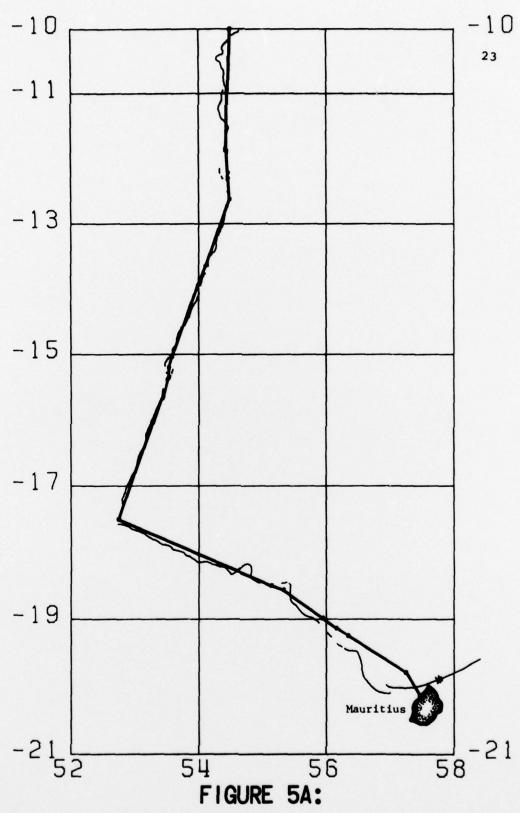
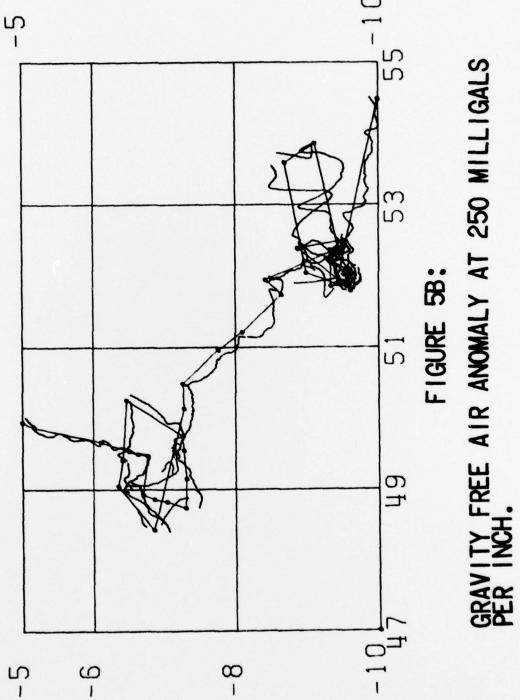


FIGURE 4D:

PER INCH. SHIP'S TRACK EQUALS



GRAVITY FREE AIR ANOMALY AT 250 MILLIGALS PER INCH.



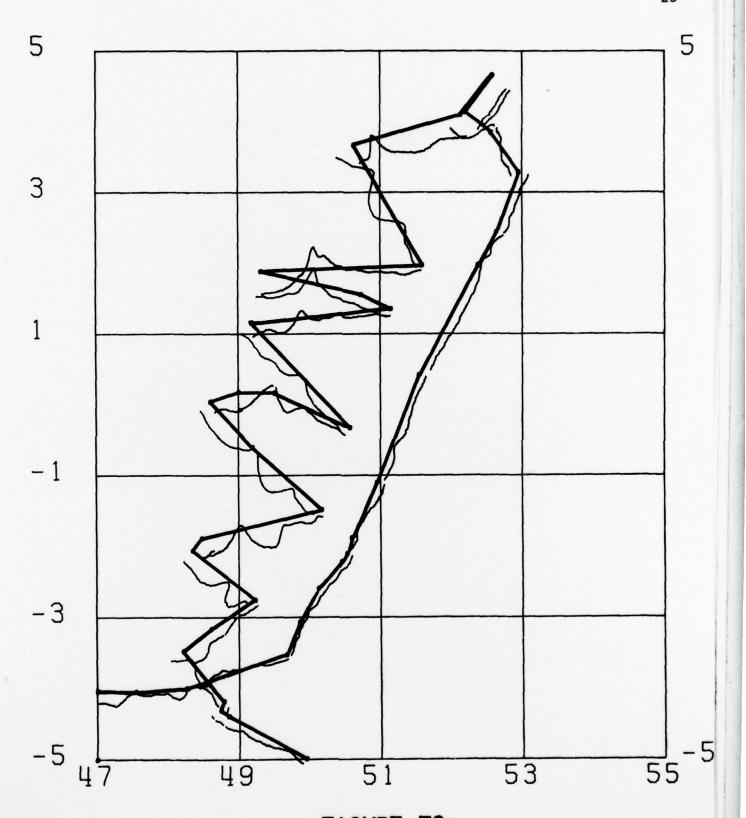
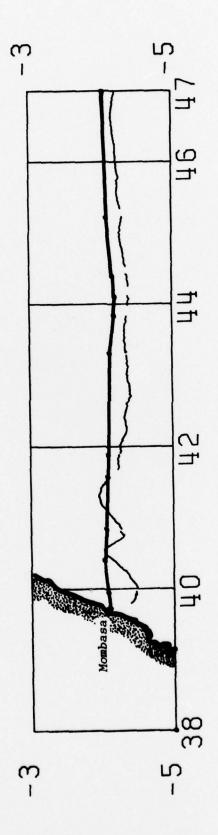


FIGURE 5C: GRAVITY FREE AIR ANOMALY AT 250 MILLIGALS PER INCH.



GRAVITY FREE AIR ANOMALY AT 250 MILLIGALS PER INCH.

FIGURE 5D:

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